

REMARKS

Claims 1-22 were pending in the above-identified application when last examined. Claims 1, 5-7, 9, 10, 12, 14, 15, and 19 are amended in this response as indicated above. The claim amendments clarify the claim language and are not intended to limit the scope of the claims, unless the claim language is expressly quoted in the following remarks to distinguish over the art cited.

Claim 14 was objected to as containing an informality and in particular as lacking proper antecedent bases for “the frames.” In response, claim 14 is amended first recite “a plurality of frames.” In view of the amendment, Applicant requests reconsideration and withdrawal of the objection to claim 14.

Claims 1-13 and 15-22 were rejected under 35 U.S.C. § 102(b) as anticipated by European Pat. Pub. No. EP 0 718 658 A1 (hereinafter Min). Applicants respectfully traverse the rejection.

Independent claim 1 distinguishes over Min at least by reciting, “a plurality of flexures respectively attaching a plurality separated sections of a perimeter of the first region to the support structure.” Min fails to disclose or suggest attaching multiple flexures to the perimeter of a region in an actuator.

Min is directed to an actuated mirror array, and Fig. 2 of Min shows a cross section of an actuating structure 250 including an actuating portion 180 and a reflecting portion 190.

Min discloses forming an MxN rectangular array of the actuating structures 250. As shown in Fig. 2, Min uses a cantilevered design, where each actuating structure 250 has one attachment providing an electrical connection of electrodes 235 and 245 to the underlying substrate 212.

In accordance with an aspect of Applicants invention, an actuator can use multiple flexures as support around the perimeter of a piezoelectric structure, so that dishing action of the piezoelectric structure provides actuation along a direction perpendicular to the plane of the perimeter. Multiple flexures can also provide multiple separated electrical connections. For example, three flexures can provide six degrees of constraint to the piezoelectric structure and facilitate making independent connections to three electrodes in the piezoelectric structure. A single cantilevered beam is generally inferior in terms of strength and tip rotation since the piezoelectric effect tends to dish the beam. Further, the layout of electrical

connection to Min's structure can be complex. Min fails to disclose or suggest a piezoelectric structure employing multiple flexures or how such structure can facilitate electrical connections and achieve actuation in a desired direction without tilting or lateral forces. Accordingly, claim 1 is patentable over Min.

Claims 2-13 depend from claim 1 and are patentable over Min for at least the same reasons that claim 1 is patentable over Min.

Claim 3 further distinguishes over Min by reciting, "two of the flexures provide respective electrical connections to the first and second electrodes." As indicated above, Min fails to suggest two flexures connected to a region. Further, in the structure shown in Fig. 2 of Min, electrodes 235 and 245 are connected together, and Min does not indicate that a flexure connects to intermediate electrode 295.

Independent claim 15 distinguishes over Min at least by reciting, "a plurality of flexures respectively attached to a plurality of separated sections of a perimeter of the region." As noted above, Min fails to disclose or suggest attaching a plurality of flexures to a region in an actuator. Accordingly, claim 15 is patentable over Min.

Claims 16-18 depend from claim 15 and are patentable over Min for at least the same reasons that claim 15 is patentable over Min.

Independent claim 19 distinguishes over Min at least by reciting, "a mirror membrane attached to the piezoelectric actuators so that independent actions of the piezoelectric actuators control a contour of the mirror membrane." In contrast, Min discloses an array of mirrors attached to respective actuators, not a mirror membrane attached to multiple actuators. Further, it would not have been obvious to modify Min to replace multiple mirrors in Min's structure with a single mirror membrane because Min fails to indicate or suggest that actuators in the array are suitable. In particular, Min fails to suggest that the actuators fail to cause lateral movement that would stress or distort a mirror membrane. Accordingly, claim 19 is patentable over Min.

Claims 20-22 depend from claim 19 and are patentable over Min for at least the same reasons that claim 19 is patentable over Min.

For the above reasons, Applicants request reconsideration and withdrawal of the rejection under 35 U.S.C. § 102.

Claim 14 was rejected under 35 U.S.C. § 103(a) as unpatentable over Min in view of U.S. Pat. No. 2,714,642 (Kinsley). Applicants respectfully traverse the rejection.

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Claim 14 distinguishes over the combination of Min and Kinsley at least by reciting, "the array comprise a plurality of frames of a hexagonal shape and arranged in a hexagonal array, and the support structure for each actuator in the array comprises one of the frames." Min fails to suggest either hexagonal frames or a hexagonal array of actuators. Kinsley starting at column 2, line 57, states, "The flexure plate may be rectangular, circular or of any number of other geometric shapes." However, the quoted passage from Kinsley is directed to a single actuator, and Kinsley fails to disclose or suggest arrays of actuators. Accordingly, Min and Kinsley whether considered separately or in combination fails disclose or suggest a hexagonal array as recited in claim 14.

Further, it would not have been obvious to combine structures from Min and Kinsley because of the distinctly different construction of their respective inventions. In particular, Min is directed to a device that can be fabricated using wafer processing techniques such as layer deposition, photolithography, and etching, and Kinsley is directed to a system manufactured through assembly of components. There is no indication that the structures taught by Kinsley could be fabricated for or integrated into the actuator arrays of Min. Accordingly, claim 14 is patentable over the combination of Min and Kinsley.

For the above reasons, Applicants request reconsideration and withdrawal of the rejection under 35 U.S.C. § 103.

Claims 32-37 are added. New claims 32-34 depend from claim 19 and are patentable for at least the same reasons that claim 19 is patentable. New claims 35-37 depend from claim 1 and are patentable for at least the same reasons that claim 1 is patentable.

In summary, claims 1-22 were pending in the application. This response amends claims 1, 5-7, 9, 10, 12, 14, 15, and 19 and adds claims 32-37. For the above reasons, Applicants respectfully request allowance of the application including claims 1-22 and 32-37.

Please contact the undersigned attorney at (408) 927-6700 if there are any questions concerning the application or this document.

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Respectfully submitted,



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